## The Prior Art

EP 709,499 Auerbach (Auerbach); U.S. 4,454,189 Fukata (Fukata); U.S. 6,130,292 Harwood et al (Harwood); U.S. 4,950,529 Ikeda et al (Ikeda); EP 353,717 Senga (Senga).

## The Rejections

Claims 1, 8, 10, 18 and 21-24 as unpatentable over Auerbach in view of Fukata. Paragraph 3 of the Action.

Claims 1, 18 and 21-22 as unpatentable over Harwood in view of Fukata. Paragraph 4 of the Action.

Claims 1, 18 and 21-22 as unpatentable over Ikeda in view of Fukata. Paragraph 5 of the Action.

Claims 6, 8 and 10 as unpatentable over Harwood or Auerbach, each in view of Fukata and Senga. Paragraph 8 of the Action.

## Traversal

Applicants present their traversal of the rejections below. They first introduce the 132 Declaration. Table 1 Results of Capillograph Measurement, Fig. 1, Fig. 2, Tables and Figures and Table 1 presenting results from Example 1 to Com. Exp. 3 are taken literally from the 132 Declaration.

## The 132 Declaration

### On the non-Newtonian Coefficient (N)

The Examiner's position is that the Fukata fibers inherently have a non-Newtonian Coefficient of 1.05-1.20. See the Action, fourth paragraph on page 3.

"RYTON" P-4 is supplied from Phillips Petroleum Co. A sample of "RYTON" described in Example 4 of Fukata has a value of 1.67 for non-Newtonian coefficient with a melt viscosity of 2310 poise (or 23.1 Pa's) as shown in Table 1 and Figs. 1 and 2.

As is seen in Table 1, the non-Newtonian Coefficient (N) of 1.67 for "P-4", which is a highly cured product, is equivalent to the N values of 1.56 for "K-4G (highly cured product: DIC)," 1.80 for "LD-10G (mildly cured product: DIC)," 2.04 for "LT-30G" (TCB branched product: DIC)," and 1.49 for "M2100 (cured produce: Toray)," and significantly different from the N values of 1.05 for "T-1G (non-cured product: DIC)" and 1.10 for "ML305 (linear product: DIC)" produced by DIC.

**Table 1: Capillograph Measurement**

Results of Capillograph Measurement
For U.S. Patent Application No. 09/317,986
(MITSUI CHEMICAL ANALYSIS CENTER)

| Supplier | DIC | DIC | DIC | DIC | DIC | Toray | Philips |
|---|---|---|---|---|---|---|---|
| Grade | T-1G | ML305 | K-4G | LD-10G | LT-30G | M2100 | P-4 |
| L/N | 1D1X088G | #0180 | 1D4R001G | 1C10LD1G | 1B90001G | 1900002 | 80-7-0037 |
| V6 (Pa·s) | 35 | 54 | 223 | 1390 | 3120 | 163 | 231 |
| V6(poise) | 350 | 540 | 2230 | 13900 | 31200 | 1630 | 2310 |
| N | 1.05 | 1.10 | 1.56 | 1.80 | 2.04 | 1.49 | 1.67 |
| Comment | Non-cure | Liner | Highly cure | Mild cure | TCB branch | Cure | Highly cure |

N : Non-Newtonian Coefficient

Conditions for Measurement

Apparatus : Capillograph-1B (Toyo Seiki Kogyo Co., Ltd.)

Temperature : 300°C

L/D : 40/1

These differences are shown in Figs. 1 and 2. Figs. 1 shows the relationship between the non-Newtonian Coefficient (N) and Viscosity V6 (Pa, s) and Fig. 2 shows also the relationship between the non-Newtonian Coefficient (N) and Viscosity V6 (poise).

**Fig. 1 and Fig. 2**

Fig. 1

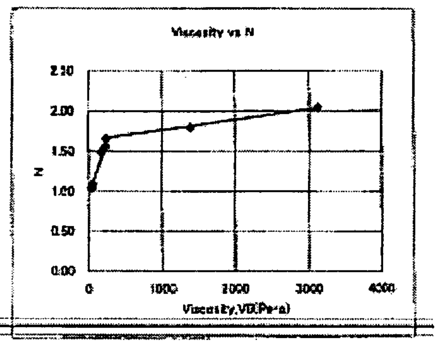
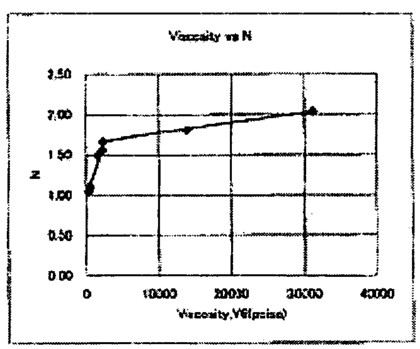


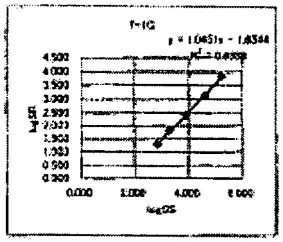

Fig. 2

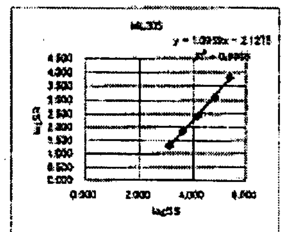


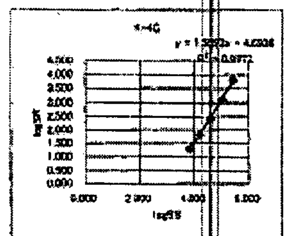
## Tables and Figures

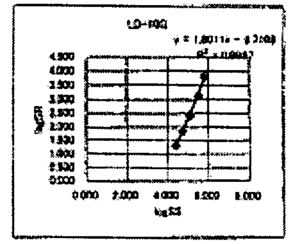
Tables and Figures

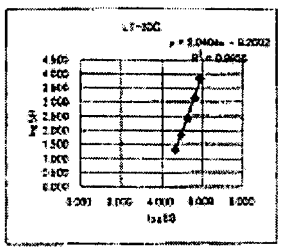
| Supplier | DIC | | DIC | | DIC | | DOC | | DIC | | Toray | | Phillips | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grade | T-1G | | ML305 | | K-4G | | LD-10G | | LT-30G | | M2100 | | P-4 | |
| VS (Pa·s) | 33 | | 54 | | 223 | | 1392 | | 3123 | | 183 | | 231 | |
| VS (poise) | 330 | | 540 | | 2230 | | 13900 | | 31200 | | 1830 | | 2310 | |
| SR $S^{-1}$ | SS Pa | Vis Pa·s | SS Pa | Vis Pa·s | SS Pa | Vis Pa·s | SS Pa | Vis Pa·s | SS Pa | Vis Pa·s | SS Pa | Vis Pa·s | SS Pa | Vis Pa·s |
| 2.000E+01 | 7.268E+02 | 3.633E+01 | 1.306E+03 | 6.530E+01 | 8.492E+03 | 4.246E+02 | 2.643E+04 | 1.322E+03 | 4.592E+04 | 2.296E+03 | 5.333E+03 | 2.666E+02 | 9.440E+03 | 4.720E+02 |
| 6.667E+01 | 1.552E+03 | 2.328E+01 | 3.861E+03 | 5.792E+01 | 1.548E+04 | 2.324E+02 | 5.561E+04 | 8.344E+02 | 8.957E+04 | 1.343E+03 | 1.453E+04 | 2.180E+02 | 2.284E+04 | 3.426E+02 |
| 2.667E+02 | 7.884E+03 | 2.954E+01 | 1.488E+04 | 5.582E+01 | 4.008E+04 | 1.503E+02 | 1.259E+05 | 4.720E+02 | 1.799E+05 | 6.746E+02 | 3.948E+04 | 1.481E+02 | 5.628E+04 | 2.973E+02 |
| 1.333E+03 | 4.127E+04 | 2.096E+01 | 6.752E+04 | 5.064E+01 | 1.093E+05 | 8.196E+01 | 4.148E+05 | 3.338E+02 | 4.153E+05 | 3.115E+02 | 1.074E+05 | 8.058E+01 | 1.364E+05 | 1.023E+02 |
| 6.667E+03 | 1.652E+05 | 2.478E+01 | 2.444E+05 | 3.666E+01 | 2.653E+05 | 3.979E+01 | 6.443E+05 | 9.665E+01 | 7.598E+05 | 1.139E+02 | 2.596E+05 | 3.893E+01 | 3.094E+05 | 4.641E+01 |
| logSR | logSS | | logSS | | logSS | | logSS | | logSS | | logSS | | logSS | |
| 1.301 | 2.840 | | 3.117 | | 3.912 | | 4.422 | | 4.661 | | 3.727 | | 3.975 | |
| 1.824 | 3.190 | | 3.587 | | 4.190 | | 4.745 | | 4.952 | | 4.162 | | 4.359 | |
| 2.426 | 3.902 | | 4.173 | | 4.603 | | 5.100 | | 5.255 | | 4.596 | | 4.743 | |
| 3.125 | 4.610 | | 4.829 | | 5.039 | | 5.404 | | 5.619 | | 5.031 | | 5.135 | |
| 3.824 | 5.218 | | 5.388 | | 5.424 | | 5.809 | | 5.881 | | 5.421 | | 5.491 | |
| n | 1.05 | | 1.10 | | 1.54 | | 1.80 | | 2.04 | | 1.49 | | 1.67 | |

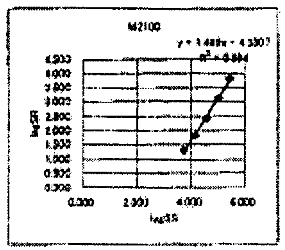


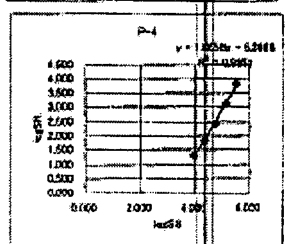



In the Tables and Figures above, the non-Newtonian Coefficient (N) of all kinds of PPS polymers currently measured for commercially available PPS polymers substantially falls in a range of 1.05 to 2.04, or around a range of 1-2.

**<u>On Melting Point and Melt Viscosity</u>**

With respect to "P-4," its measured melting point of 276.5°C corresponds to a melting point of 277°C of "RYTON" in Example 4 of Fukata, and the measured melt viscosity of "P-4" is 2310 poise at 300°C as shown in the column "Phillips" P-4 in the Tables and Figures, whereas the melt viscosity of "RYTON" in Example 4 of the cited reference is 2200 poise, giving a viscosity difference of 110 poise between "P-4" and "RYTON" of the cited reference.

As is clear from Table 1, the non-Newtonian Coefficient (N) of 1.67 for "P-4," which is a highly cured product, is equivalent to the N value of 1.56 for "K-4G (highly cured product: DIC)," 1.80 for "LD-10G" (mildly cured product: DIC)," 2.04 for "LT-30G" (TCB branched product: DIC)," and 1.49 for "M2100 (cured product: Toray)," and is significantly different from the non-Newtonian Coefficient (N) of 1.05 for "T-1G (non-cured product: DIC)" and 1.10 for "ML305 (linear product: DIC)".

These differences are shown in Figs. 1 and 2. Fig. 1 shows the relationship between non-Newtonian Coefficient (N) and Viscosity V6 (Pa, s) and Fig. 2 shows also the relationship between the non-Newtonian Coefficient (N) and Viscosity V6 (poise).

As is seen in both Figs. 1 and 2, the N value of "P-4" is a line with a gently declining slope corresponding to the N values of high melt viscosities including the N values of 1.80 for "LD-10G" (mildly cured product: DIC)," and 2.04 for "LT-30G (TCB branched product: DIC),"

which are different from the N values of 1.05 for "T-1G (non-cured product: DIC)," and 1.10 for "ML305 (linear product: DIC)," as well as the N values of 1.49 for "M2100 (cured product: Torray)," and 1.56 for "K-4G (highly cured product: DIC) on the line with a sharp declining slope.

The PPS polymer of the present invention has a non-Newtonian coefficient (N) of 1.05-120 (claim 1), preferably of 1.06-1.19 (claim 21) and a melt viscosity ($V_6$) of 295-400 poise as shown in Table 1 (PAS-1, PAS-2, PAS-5 and PAS-6) - see claim 22 - in the specification as shown below. Thus, the melt viscosity is far lower than that of "M2100," "RYTON" of the cited reference, "K-4," "P-4" supplied from Phillips, "LD-10G" and "LT-30G" in a range of 1630-31200 poise.

**The Obviousness Rejection over Auerbach in view of Fukata**

Major distinguishing features of the present invention are found in that the present invention makes it possible to produce non-woven fabrics from a PPS polymer having extremely low melt viscosities in a stable manner by melt-blowing under a high-velocity air stream. See page 19, lines 2-5 and Example 1 in the present specification.

With respect to the rejection over Auerbach in view of Fukata, at page 3 of the Action, third full paragraph, the Examiner refers to Auerbach and at that same page in the fourth full paragraph, the Examiner refers to Ikeda. It is assumed that the Examiner means to refer to Auerbach in both instances.

Claim 1 of the present application calls for: "A melt-blown, non-woven fabric having an average fiber diameter of 10 μm or less comprising polyarylene sulfide having a branched structure and a non-Newtonian coefficient of 1.05-1.20."

With respect to the rejection over Auerbach in view of Fukata, Auerbach is silent regarding any polyarylene sulfide issue (PPS) polymer having a non-Newtonian Coefficient of 1.05-1.20 as recited in claim 1. Auerbach does teach the use of a 300 poise polyarylene sulfide (page 7, lines 23-25 of Auerbach) as the Examiner states in the Action (page 3, third paragraph).

However, it appears quite clear that the essential basis for the Examiner's rejection is that the Fukata fibers inherently have a non-Newtonian Coefficient of 1.05-1.20 (page 3, fourth paragraph of the Action).

The 132 Declaration clearly establishes this is not the case. See the discussion under **On the non-Newtonian Coefficient (N)**.

Thus, the Examiner's inherency position is seen to be incorrect.

With respect to the Examiner's obviousness position, a major distinguishing feature of the present invention is that the present invention makes it possible to produce non-woven fabrics from the PPS polymer of the present invention having an extremely low melt viscosity in a stable manner by melt-blowing using a high-velocity air stream. See the present specification at page 19, lines 2-5 and Example 1.

With respect to the rejection over Auerbach in view of Fukata, Applicants respectfully submit that there is nothing of record which would lead one of ordinary skill in the art to the

narrow non-Newtonian Coefficient (N) values of the present invention. Thus, no matter what view is taken of Auerbach or Fukata, there is no motivation in the prior art to discover "optimum or workable ranges" since neither Auerbach or Fukata suggests that the non-Newtonian Coefficient (N) as claimed would in fact be the only operable or workable range. The 132 Declaration shows that the prior art does not suggest inherently or certainly does not teach motivation to reach the 1.05-1.20, preferably 1.06-1.119 range, for the non-Newtonian Coefficient (N) of the present invention.

Applicants believe that the above position is established by a careful review of Fukata, as now presented.

In contrast to the present invention, Fukata's "RYTON" polymer has a melt viscosity of 2000 poise and is extruded through a spinneret having small holes, the extrudates being introduced into an aspirator, followed by discharging the extrudates from the aspirator at a rate of 1700 m/min to obtain PPS filaments (see col. 6, lines 44-59, Example 4 of Fukata). Such procedures are completely different from the present invention in not using a melt-blowing method.

Further, Applicants wish to strongly emphasize that Fukata teaches that to produce a web of filaments of the Fukata PPS polymers, it is necessary to subject the collected PPS filaments to bonding or interlocking by needle punching or water jet interlocking (see col. 3, lines 18-41; col. 4, lines 52-59; and claims 12, 18 and 19 of Fukata). This teaching would be positive proof showing to one skilled in the art that the Fukata sheet of PPS filaments is not produced by a melt-blowing method.

The non-Newtonian Coefficient (N) of 1.05-1.20, is an essential factor required for the PPS polymer of the present invention. It can thus be said that a polyarylene sulfide having a non-Newtonian Coefficient (N) and having a branched structure as claimed having an (N) in the range of $1.05 \leq n \leq 1.20$ is necessary to achieve the results of the present invention.

The non-Newtonian Coefficient of 1.67 for "RYTON" P-4 falls outside the range of $1.05 \leq n \leq 1.20$ of polyarylene sulfide having a branched structure or a crosslinked structure as claimed in the present application.

"RYTON" P-4 supplied from Phillips Petroleum Co., is a highly cured product and has a non-Newtonian Coefficient (N) of 1.67 and a melt viscosity of 2310 poise, which value is far higher than that of the PPS polymer of the present application, and does not inherently have a non-Newtonian coefficient (N) of 1.05-1.20, but has a non-Newtonian coefficient (N) of greater than 1.20.

In distinction, a polyarylene sulfide having a branched structure as claimed has a non-Newtonian Coefficient (N) with a branched structure in the range of $1.05 \leq n \leq 1.20$.

Neither Auerbach or Fukata, taken alone or in combination, teaches or suggests a polyarylene sulfide having a branched structure with a non-Newtonian coefficient of 1.05-1.20.

With respect to claims 8, 10, 21 and 22, Applicants rely upon their arguments above regarding claim 1.

With respect to claim 18, Applicants rely upon the above arguments regarding claim 1.

With respect to claims 23 and 24, Applicants again rely on their arguments regarding claim 1.

Withdrawal of the rejection over Auerbach in view of Fukata is requested.

**The Rejection Over Harwood in view of Fukata**

Applicants first address Harwood.

Harwood teaches a resin composition for melt blowing consisting essentially of a polyarylene sulfide which is cured or semi-cured and a polyolefin blended in an amount of about 1-40% by weight of the total blend for melt blowing (see Abstract; claim 1, and col. 5, lines 36-65 of Harwood). Thus, although Harwood teaches melt blown polyarylene sulfide fibers, particularly polyphenylene sulfide PPS fibers, the Harwood PPS used for melt blowing is blended with a polyolefin having, e.g., a melt flow rate of 35-40g/10 min measured at 318°C under a 5 kg load (see col. 5, lines 32-35 and lines 43-45 of Harwood), which is different from the present invention in using polyarylene sulfide having a branched structure and a non-Newtonian coefficient of 1.05-1.20 without blending with such a polyolefin as used in Harwood.

Although Harwood teaches melt blown fibers having a diameter ranging from less than 1 micron up to about 12 microns or more (see col. 7, lines 58-64 of Harwood), Harwood is silent regarding any polyarylene sulfide having a non-Newtonian Coefficient of 1.05-1.20 with a branched structure.

The Examiner states at page 5, lines 6-8 of the Office Action that:

> "It is the Examiner's position that Harwood's fibers inherently have a non-Newtonian Coefficient of 1.05-1.20, because said fibers are subjected to similar grafting process as applicant."

The flaw in the Examiner's reasoning here is that there is nothing of record which would correlate any "grafting process" with any non-Newtonian Coefficient. The plain fact is that of the universe of PPS materials, there can be no question but that many which can be grafted

would not have a non-Newtonian Coefficient as claimed. Simply stated, there is nothing of record which correlates any "grafting capability" with any non-Newtonian Coefficient, and for this reason alone, the Examiner's reasoning regarding inherency in Harwood is without basis.

Further, again Applicants wish to emphasize that the Harwood fibers are produced from a composition of polyarylene sulfide issue blended with a polyolefin in an amount of about 1-40% by weight of the total blend.

As earlier discussed, and as established by evidence of record, the Fukata fibers in Example 4 do not inherently have a non-Newtonian Coefficient (N) of 1.05-1.20, rather, have a non-Newtonian Coefficient of greater than 1.20.

Thus, neither Harwood nor Fukata, taken alone or in combination, teach or suggest the use of a polyarylene sulfide having a branched structure which has an non-Newtonian Coefficient of 1.05-1.20.

Accordingly, Applicants submit that claim 1 stands unobvious over Harwood in view of Fukata.

With respect to claims 8 and 10, 18, 21 and 22, Applicants rely on their arguments regarding claim 1.

**Rejection over Ikeda in view of Fukata**

Applicants first address Ikeda.

Ikeda discloses a fabric composed of an extra fine fiber having a mean diameter of 0.1-8.0 μm obtained by melt-blowing a linear polymer of polyphenylene sulfide (see claim 1; col. 3, lines 48-55, and col. 4, lines 12-13 of Ikeda). This appears to be because PPS resins generally

have high oxidative properties and are apt to be partially crosslinked, thereby leading to problems when conventional spinning and drawing techniques are applied thereto (see col. 3, line 56 to col. 4, line 7 of Ikeda). Ikeda is thus different from the invention of claim 1 calling for that: "A melt-blown, non-woven fabric having an average fiber diameter of 10 μm or less comprising polyarylene sulfide having a branched structure and a non-Newtonian coefficient of 1.05-1.20".

The Examiner states at page 7, lines 6-7 of the Office Action that:

> "It is the Examiner's position that Ikeda's fibers inherently have a non-Newtonian Coefficient of 1.05-1.20."

However, Applicants respectfully submit that the Examiner's position on Ikeda regarding inherency is incorrect at least because of the fact that the Ikeda fibers are produced from a **linear** polymer of polyphenylene sulfide.

Thus, Ikeda fails to teach a melt-blown, non-woven fabric obtained by extruding a branched or crosslinked PAS polymer alone having a non-Newtonian coefficient of 1.05-1.20, as Ikeda clearly recites "an extra fine fiber obtained by melt-blowing a linear polymer of polyphenylene sulfide", quite different from that recited in claim 1 or claim 18 of the present application.

Further, the Fukata fibers in Example 4 do not inherently have a non-Newtonian Coefficient (N) of 1.05-1.20, rather have a non-Newtonian coefficient (N) of more than 1.20.

As is clear from the foregoing, none of Ikeda and Fukata, taken alone or in combination, teaches or suggests the polyarylene sulfide having a branched structure or a crosslinked structure with a non-Newtonian Coefficient of 1.05-1.20.

Accordingly, Applicants respectfully submit that Ikeda taken with Fukata do not render the claims herein obvious.

With respect to claims 8, 10, 21 and 22, Applicants rely upon their arguments regarding claim 1.

**The Rejection over Harwood or Auerbach in view of Fukata and Senga**

As should be clear from the foregoing discussion, none of Harwood, Auerbach or Fukata, taken alone or in any combination thereof, teaches or suggests a polyarylene sulfide having a branched structure and a non-Newtonian coefficient of 1.05-1.20 as recited in claim 1 of the present application.

Therefore, with respect to claims 6, 8 and 10 of the present application, their patentability over Harwood or Auerbach in view of Fukata is clear at least by virtue of the basis of their dependence from claim 1.

Senga teaches a polyarylene sulfide having an inherent viscosity [$\eta$ inh] of 0.1 to 0.5/0.5 dl/g; a weight-average molecular weight of 1 x $10^4$ to 2 x $10^5$; and a ratio of inherent viscosity [$\eta$ inh] to calculated viscosity [$\eta$] ([$\eta$ inh]/[$\eta$]$_{calc}$) of 0.4/1 to 0.8/1. If the ratio of inherent viscosity to calculated viscosity is below the lower limit, the degree of crosslinking becomes too high so that the resin becomes too brittle and the viscosity becomes too high, thus making moldability poor. Furthermore, the polyarylene sulfide may gel upon polymerization, thereby making stable manufacture difficult. On the other hand, if the ratio exceeds the upper limit, the non-Newtonian behavior becomes too small to effectively prevent the occurrence of molding flash upon injecting molding (see page 3, line 43 to page 4, line 6 of Senga).

Senga is silent regarding not only regarding a polyarylene sulfide to be used for the melt blown fibers but also regarding the range of the non-Newtonian coefficient of the polyarylene sulfide having a branched structure with a non-Newtonian coefficient of 1.05-1.20 suitable for melt blown fibers.

Applicants thus respectfully submit that claims 6, 8 and 10 are not rendered obvious over Harwood or Auerbach, each in view of Fukata and Senga.

Accordingly, withdrawal of the rejection is requested.

**Unexpected Results**

Applicants present below Table 2 which is fairly based with some deletions on Table 1 at page 21 of the specification where "O" means Good Melt-Blowing Stability and "Δ" means Poor Melt-Blowing Stability.

Table 2

| Run | Non-Newtonian Coefficient N | Average Fiber Diameter (μm) | Process Condition |
|---|---|---|---|
| Comp. Ex. 2 | 1.00 | 13.1 | Δ |
| Comp. Ex. 1 | 1.02 | 15.0 | Δ |
| Example 4 | 1.06 | 5.7 | O |
| Example 2 | 1.09 | 8.1 | O |
| Example 1 | 1.13 | 7.5 | O |
| Example 3 | 1.19 | 9.5 | O |
| Comp. Ex. 3 | 1.22 | 17.3 | Δ |

Keeping in mind that the N range in the broader claims herein is 1.05-1.20, what do the data show?

First, the data show consistency, i.e., it is believed that the best comparison which establishes the criticality of the non-Newtonian coefficient is a comparison between Comparative Example 1 (N = 1.02) versus Example 4 (N = 1.06) and a comparison between Example 3 (N = 1.19) versus Comparative Example (N = 1.22). All remaining Examples and the remaining Comparative Example present data entirely consistent with the data relied upon and shown.

Thus, Applicants respectfully submit that it is clear from Table 2 that the symbol "O" (good melt blown stability without clogging the nozzles in a die) and "Δ" (poor melt blown stability with clogging the nozzles in die), show the evaluation of process conditions and establish the difference between "O" and "Δ" is quite distinct and dramatic, i.e., in accordance with the invention die clogging takes place whereas in accordance with the prior art die clogging does not take place.

One major feature of the present invention lies in the fact that each fiber which constitutes the non-woven fabric of the present invention has an average fiber diameter of 10 μm <u>or less</u>. It is very difficult to obtain such a fine fiber in itself. As a consequence, it is essentially technically impossible to arrange fine fibers having various kinds of N values for the non-Newtonian coefficient alone which would have a simple or sole size of a single average diameter of 10 μm <u>or less</u>. Table 2, Applicants submit, shows that the process conditions for melt-blowing can be synergistically improved by following a range of average diameter of the non-woven fabric and a range for the non-Newtonian coefficient as claimed in the present application.

The present specification does not teach or suggest that it is solely the non-Newtonian coefficient which leads to the results of the present invention, rather, as shown in Table 2, both the <u>range</u> on the average fiber diameter and the <u>range</u> of the non-Newtonian coefficient are important factors.

In view of Table 2 above, the criticality of the non-Newtonian coefficient is clearly illustrated based upon a comparison between Comparative Example 1 and Example 4 and a comparison between Example 3 and Comparative Example 3.

"Process Condition" in the 4$^{th}$ column of Table 2 represents melt-blowing stability disclosed on page 20, lines 9-14, and page 21, lines 8-17, of the specification of the present application such that:

"O": Good melt blown stability without clogging the nozzles in a die and forming melt blown, non-woven fabrics having a uniform basis weight; and

"Δ" : Poor melt-blown stability with the nozzles often clogged in a die and forming melt blown, non-woven fabrics having a non-uniform basis weight.

That is, as is clear from the symbols " O " and "Δ" each showing the evaluation results of the process conditions, the difference between " O " and "Δ" is clearly found in whether or not the die clogging takes place.

Namely, to achieve the uniform structure of the fabrics with a uniform basis weight, fiber diameters of the fibers in the non-woven fabrics are required to be in a specified narrow range, for instance, a constant diameter in an ideal case. When fiber diameters of the fibers in the non woven fabrics are distributed in a wide range, for instance, each having an uneven diameter, the

structure of the fabrics becomes not uniform, having a non-uniform basis weight. Accordingly, the uniformity of fiber diameters in the non-woven fabrics can be finally attributed to whether or not die clogging takes place.

In conclusion, die clogging causes the fiber diameters of the fibers to become small and, clogging the nozzles leads to the development of an accumulation of pressure in the die, which is blown off, thereby making the fiber diameters thereof large. Accordingly, the expression of "good" or "poor" for "Melt-Blown Stability" in the 5th column of Table 1 on page 21 of the specification is clearly different.

**Statements Regarding Shear Stress and Rate of Shear**

At the top of page 3 of the Action, regarding Auerbach, the Examiner believes that it would have been obvious to reach the non-Newtonian Coefficient of the present claims "by the reasonable expectation of varying the shear stress and rate of shear.", here referring to Auerbach. The Examiner makes a similar statement at page 5 of the Action, third full paragraph regarding Harwood and at page 7 of the Action, third full paragraph, regarding Ikeda.

Applicants would like to offer a few comments thereon.

The non-Newtonian coefficient is shown by the following equation (1'):

Shear Rate = $(\text{Shear Stress})^N$ (1'),
wherein K is a constant and N is a non-Newtonian coefficient.

Applicants have calculated the relation between Shear Rate (SR) and Shear Stress (SS) with respect to each N of 1.0, 1.2, 2.0, 3.5 and 25 under K obtained from a PPS polymer having N of 1.03, and the results are shown in Figs. 5 and 6 below.

Fig. 5

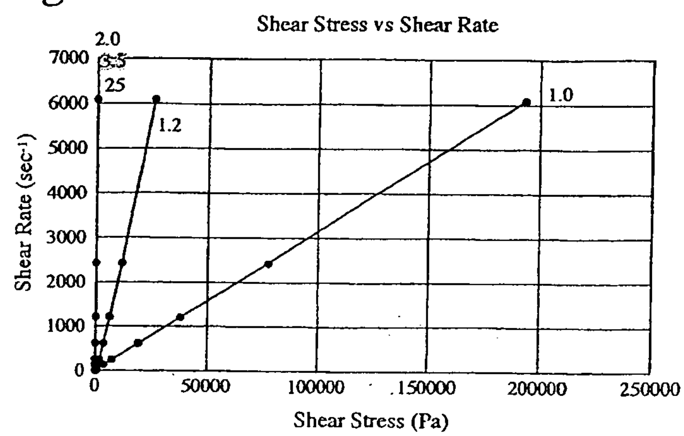
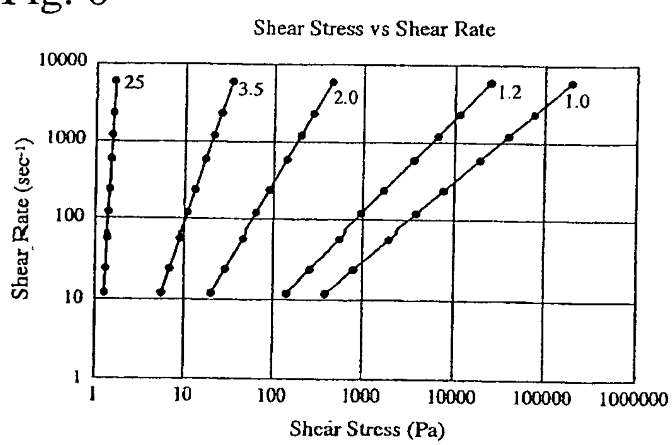

Shear Stress vs Shear Rate
2.0
3.5
25
1.2
1.0
7000
6000
5000
4000
3000
2000
1000
0
Shear Rate (sec-1)
0
50000
100000
150000
200000
250000
Shear Stress (Pa)

Fig. 6


Shear Stress vs Shear Rate
25
3.5
2.0
1.2
1.0
10000
1000
100
10
1
Shear Rate (sec-1)
1
10
100
1000
10000
100000
1000000
Shear Stress (Pa)

In Figs. 5 and 6 above, each N value was calculated under a constant value of K. These figures clearly teach that the PPS polymers having N exceeding 2.0 produce a remarkable change in Shear Rate by any change in Shear Stress, and, accordingly, it is difficult to take a flow having N exceeding 2.0 into consideration.

Applicants thus respectfully submit that there is no basis to conclude motivation "by the reasonable expectation of varying the shear stress and rate of shear."

For all of the above reasons, withdrawal of the rejections and allowance is requested.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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